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09/856,030	05/16/2001	Yasushi Nakagiri	10059-384US	2244

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AKIN GUMP STRAUSS HAUER & FELD L.L.P.  
ONE COMMERCE SQUARE  
2005 MARKET STREET, SUITE 2200  
PHILADELPHIA, PA 19103-7013

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EXAMINER

CREPEAU, JONATHAN

ART UNIT

PAPER NUMBER

1746

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/856,030

Applicant(s)

NAKAGIRI ET AL.

Examiner

Jonathan S. Crepeau

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 6-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 6-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Response to Amendment*

1. This Office action addresses newly added claims 6-11. The claims are rejected for substantially the reasons of record under 35 USC §103. Accordingly, this action is made final.

### *Claim Rejections - 35 USC § 103*

2. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-214008 in view of JP 11-3707.

Regarding claim 6, JP '008 discloses a lithium battery comprising a positive electrode and negative electrode (see paragraph 19 of the machine translation). Regarding claims 6 and 7, the positive electrode comprises a mixture of elemental sulfur powder, a metal complex of an organic sulfur compound having a thiol or thiolate group, and a conductive polymer (see paragraphs 7, 12, 17, and 18).

JP '008 does not expressly teach that the negative electrode contains a composite nitride of the formula  $\text{Li}_{3-x}\text{M}_x\text{N}$ , as recited in claim 6.

In the abstract, JP '707 discloses a secondary battery comprises a negative electrode comprising  $\text{Li}_{3-x}\text{M}_x\text{N}$  ( $0.1 \leq x \leq 0.8$ ,  $\text{M}=\text{Ti, V, Cr, Mn, Fe, Co, Ni, or Cu}$ ).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of JP '707 would motivate the artisan to use a nitride of the formula  $\text{Li}_{3-x}\text{M}_x\text{N}$  as the negative electrode active material of JP '008. In the abstract, JP '707 teaches that "deterioration of battery characteristics at high

temperature storage times can be retarded” by using this active material. Accordingly, the artisan would be motivated to use this nitride as the negative electrode active material of JP ‘008.

3. Claims 8, 9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-214008 in view of JP 11-3707 as applied to claims 6 and 7 above, and further in view of Nimon et al (U.S. Patent 6,017,651), Kawakami et al (U.S. Patent 6,372,387) and Idota (U.S. Patent 5,618,640).

JP ‘008 does not expressly teach that the positive electrode comprises a lithium-sulfur compound represented by the formula  $(\text{Li}_x\text{S})_n$  as recited in claim 8, or that the negative electrode further comprises a metal oxide such as SnO or SnO<sub>2</sub> (claims 8 and 11).

The patent of Nimon et al. is directed to lithium polymer batteries. In the abstract, the reference teaches that a sulfur electrode including at least one of elemental sulfur, lithium sulfide, and a lithium polysulfide is provided.

In column 53, lines 58-67, Kawakami et al. teach a secondary battery comprising a negative electrode comprising at least one of a tin oxide, a lithium tin oxide, and a lithium transition metal nitride, among other materials.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would find it obvious to add tin oxide or lithium tin oxide to the negative electrode of JP ‘008. It has been held to be *prima facie*

obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose. *In re Kerkhoven*, 205 USPQ 1069 (CCPA 1980). Thus, it would be obvious to use a tin oxide in addition to the lithium transition metal nitride in the negative electrode of JP '008. Furthermore, Idota et al. teach exemplary tin oxide active materials of SnO, SnO<sub>2</sub>, and Li<sub>2</sub>SnO<sub>3</sub> in Table C-1 (col. 30). Therefore, the artisan would be guided to use these materials in the negative electrode of JP '008.

Additionally, the disclosure of Nimon et al. indicates that lithium sulfides and polysulfides are functionally equivalent to the elemental sulfur disclosed by JP '008. Therefore, it would be obvious to substitute the lithium sulfide of Nimon et al. for the elemental sulfur of JP '008. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06. Further, the artisan would be guided to use Li<sub>2</sub>S<sub>8</sub> (i.e., (Li<sub>0.25</sub>S)<sub>8</sub>) as the lithium sulfide of JP '008, since this material is disclosed at column 12, line 7 of Nimon et al. Accordingly, the subject matter of claim 8 would be rendered obvious.

4. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-214008 in view of JP 11-3707 as applied to claims 6 and 7 above, and further in view of Nimon et al., Arai et al (U.S. Patent 6,475,680) and JP 10-162823.

JP '008 does not expressly teach that the positive electrode comprises a lithium-sulfur compound represented by the formula  $(\text{Li}_x\text{S})_n$  as recited in claim 8, or that the negative electrode further comprises a tin or silicon intermetallic compound (claims 8 and 10).

The patent of Nimon et al. is directed to lithium polymer batteries. In the abstract, the reference teaches that a sulfur electrode including at least one of elemental sulfur, lithium sulfide, and a lithium polysulfide is provided

In column 7, lines 37-46, Arai et al. teach a secondary battery comprising a negative electrode comprising a nitride or an "intermetallic particle compound such as aluminum, tin, and the like," among other materials.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would find it obvious to add tin or silicon intermetallic material to the negative electrode of JP '008. It has been held to be *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose. *In re Kerkhoven*, 205 USPQ 1069 (CCPA 1980). Thus, it would be obvious to use a tin or silicon intermetallic material in addition to the lithium transition metal nitride in the negative electrode of JP '008. Furthermore, JP '823 teaches exemplary tin and silicon intermetallic active materials such as Si-Ni, Si-Fe, Sn-Fe, and Sn-Ni in the abstract. Therefore, the artisan would be guided to use these materials in the negative electrode of JP '008.

Additionally, the disclosure of Nimon et al. indicates that lithium sulfides and polysulfides are functionally equivalent to the elemental sulfur disclosed by JP '008. Therefore,

it would be obvious to substitute the lithium sulfide of Nimon et al. for the elemental sulfur of JP '008. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06. Further, the artisan would be guided to use  $\text{Li}_2\text{S}_8$  (i.e.,  $(\text{Li}_{0.25}\text{S})_8$ ) as the lithium sulfide of JP '008, since this material is disclosed at column 12, line 7 of Nimon et al. Accordingly, the subject matter of claim 8 would be rendered obvious.

#### ***Response to Arguments***

5. Applicant's arguments filed June 13, 2003 have been fully considered but they are not persuasive. Applicants assert that JP 11-214008 does not actually teach the claimed "metal complex of an organic sulfur compound," and instead teaches a "composite," as set forth by the English equivalent document, Sotomura (U.S. Patent 6,345,458) in column 4, lines 1-9. In other words, it is asserted that the term "complex" disclosed by JP '008 in paragraph 11 of the machine translation is erroneous, and should be "composite" as shown by the English equivalent document. However, the Examiner maintains the position that, despite the disclosure of a "composite" by Sotomura '458, the formation of a "complex" is implicit in the disclosure of Sotomura '458. First, the relevant portion of Sotomura is reproduced below:

The metallic copper or metallic silver, which is one component of the composite electrode of the present invention, may give a composite together with PAn and SS and prevent the composite from dissolving into the electrode and dispersing from a cathode. Thus, good charging and discharging cycle life can be given. Further, the composite electrode of the present invention gives a flatter voltage than a composite electrode comprising only PAn and SS.

Thus, Sotomura teaches that the added copper or silver may give a “composite” with the polyaniline (“PAn”) and organic sulfur compound (“SS”), thus “prevent[ing] the composite from dissolving into the electrode and dispersing from a cathode. Thus, good charging and discharging cycle life can be given.” It is the Examiner’s position that this disclosure indicates that the “composite” of Sotomura actually contains a “complex” of the silver and copper ions and the organic sulfur compound which is formed *in-situ* in the electrode. As evidence of this, two other Japanese patent publications by the same inventor (Sotomura) are cited herewith, JP 10-241661 and JP 10-241662. Both references contain similar teachings, and are generally concerned with electrodes containing complexes of silver and/or copper ions with organic sulfur compounds. In paragraph 6 of the translation of JP ‘662, it is disclosed that “[t]hus, since an organic disulfide compound (monomer) is fixed by the electrode as a complex with a complex ion and a copper ion, it is suppressed that an organic disulfide compound (monomer) dissipates from an electrode. Consequently, if the electrode containing such a complex is used for a positive electrode and a cell is constituted, even it repeats charge and discharge, electric capacity cannot fall, namely, a charge-and-discharge cycle can obtain a good cell.” It is submitted that the phenomena described in JP ‘662 (suppression of organic compound dissipation, good charge-discharge cycle) are identical to the phenomena described in Sotomura ‘458 (JP ‘008). JP ‘662



clearly teaches that a complex of metal ions and the organic compound yields these results.

Thus, it may be concluded that a complex of metal ions and the organic compound would yield the same results in JP '008. The only difference between the disclosures is that the complex of JP '662 is formed before the electrode is assembled, while the complex of JP '008 is formed *in-situ* in the electrode upon mixing the metallic copper and silver with the organic sulfur compound. Accordingly, for these reasons, it is believed that JP '008 does in fact disclose a "complex" as recited in claims 6 and 8.

Note: the material disclosed at column 1, line 34 and column 5, lines 32-35 of Sotomura '458 is not considered to be a "complex" within the meaning of claims 6 and 8. This material, exemplified by the formula  $M^+-S-R-S^+-M$ , has its metal ions at the end of compound, not at the center, as is required by a "coordination complex" or "metal complex." The material of the formula  $M^+-S-R-S^+-M$  is more properly called a "salt," as is recognized in column 5, line 33 of Sotomura.

### ***Conclusion***

6. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

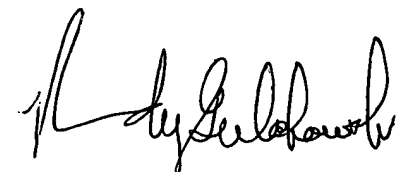
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (703) 308-4333. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 872-9310 (for non-final communications) or (703) 872-9311 (for after-final communications).

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

JSC

August 13, 2003



RANDY GULAKOWSKI  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700